

Neutrino Fixed Target Experiment at a Muon Collider

Why would a Muon Collider Help?

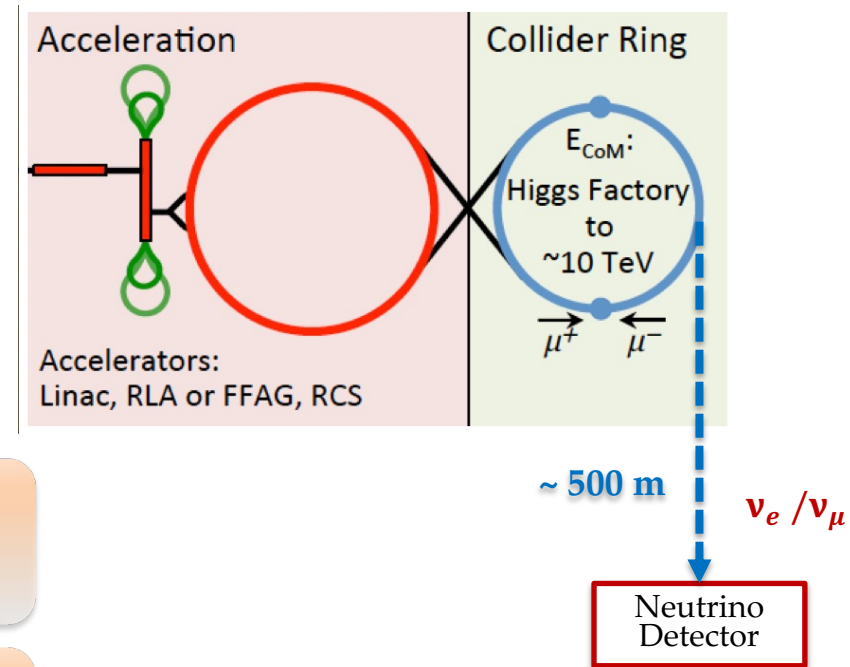
Very high beam
luminosity

Precisely known
energy spectra

Equal numbers of e/μ
(anti)neutrinos

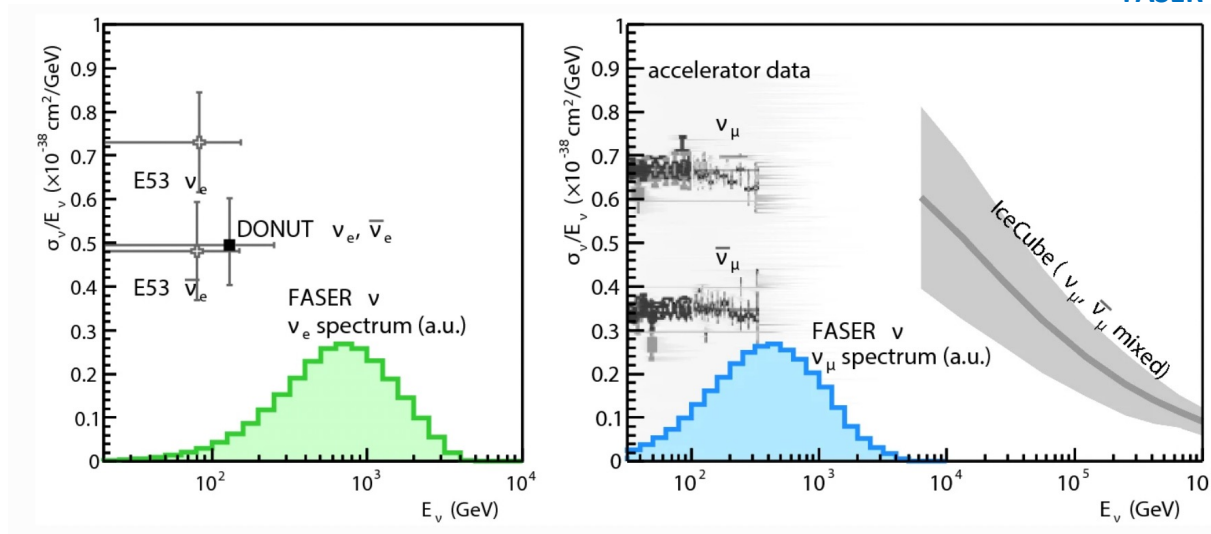
Very well determined
beam intensity

- Ideal to investigate rare/new neutrino interactions
- Search for BSM physics



Case 1: SM Search (Precision in Neutrino Cross Section Measurements)

FASER Collaboration, 2020

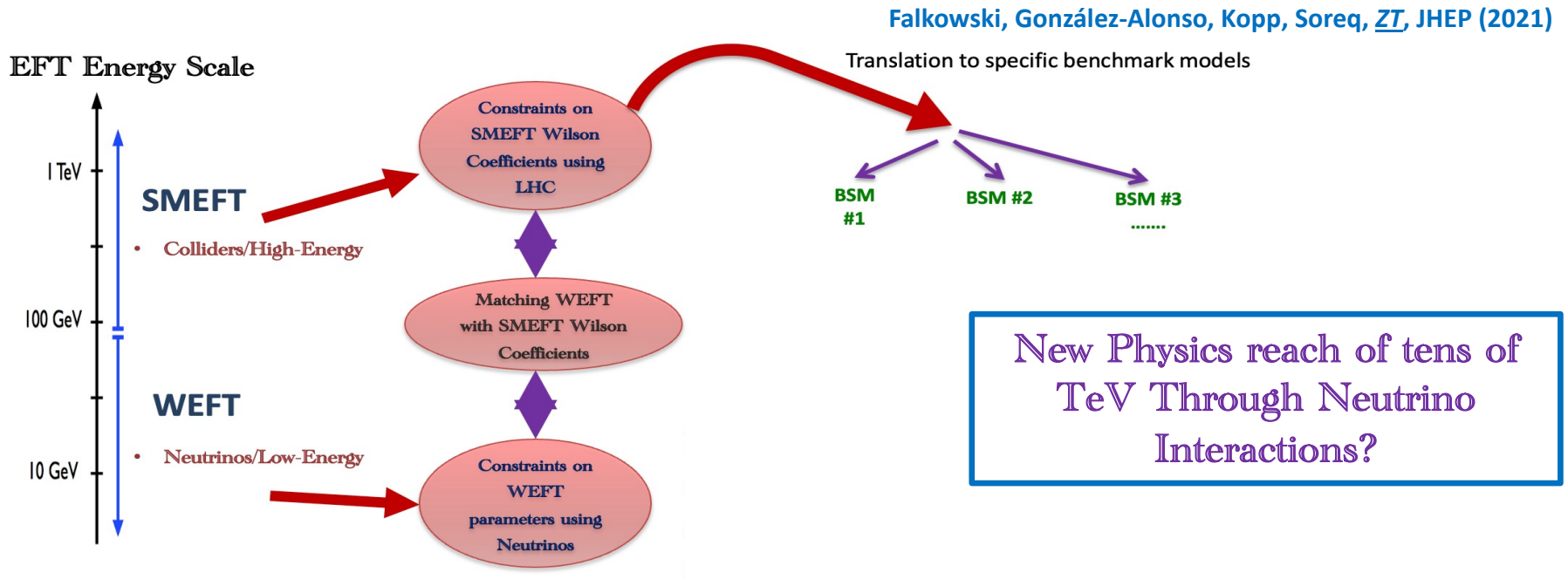


- ❑ Currently no high energy ν_e beam
- ❑ A lot of ν_μ , but not well known beam

- Well known beam, direct extraction of the x-sections with much greater precision
- DIS dominates, we can probe nucleon structure at low Bjorken x and high Q^2

**Also, running of the
weak mixing angle, etc...**

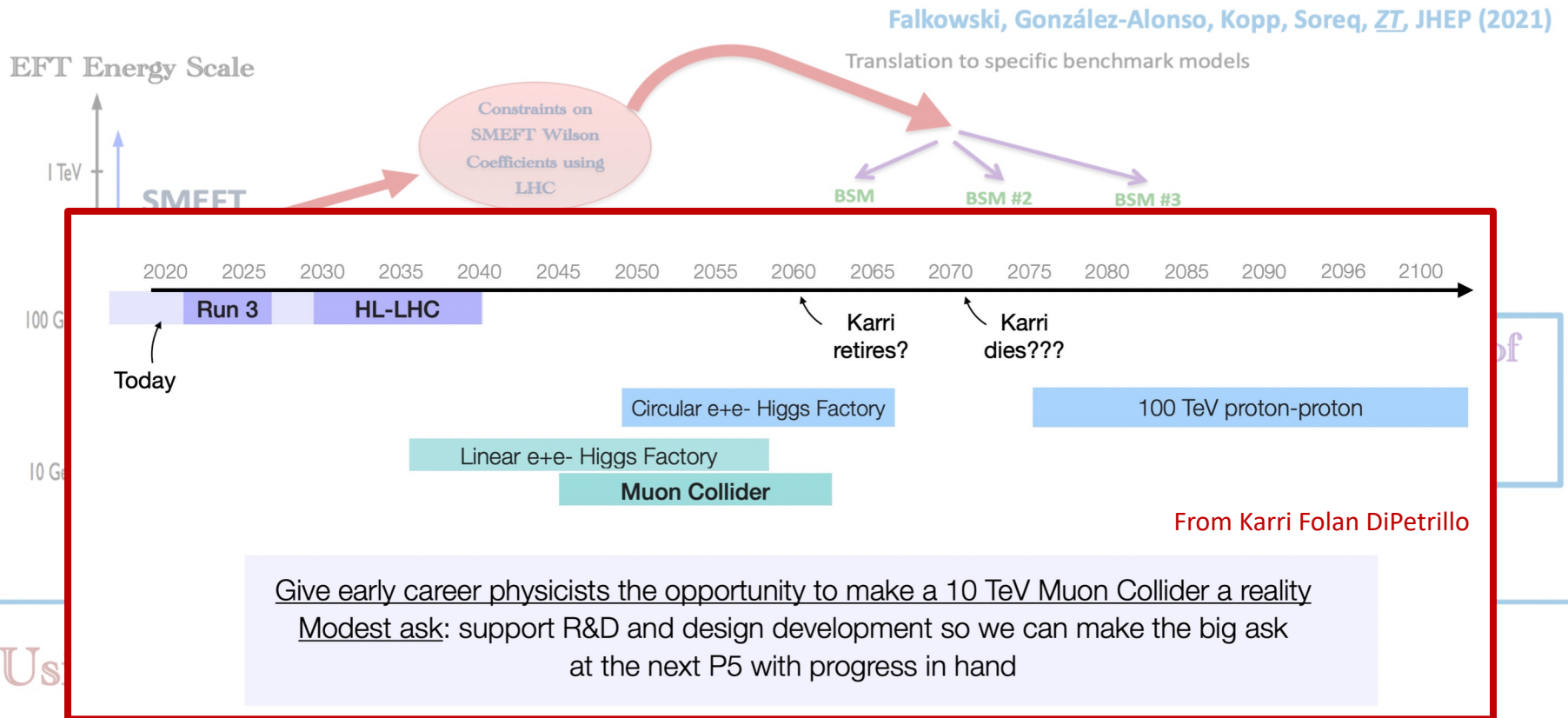
Case 2: Indirect New Physics Search (SMEFT)



Using neutrinos at a muon collider we can:

- Do precision measurements of neutrino interactions (DIS x-section, weak mixing angle, etc.)
- Probe very heavy particles by precisely measuring low-energy observables using the EFT formalism.
- Unlike other probes (ATLAS and CMS, etc.), a neutrino detector has the unique capability to identify the neutrino flavor. This is crucial complementary information in case excesses are found elsewhere in the future.
- We are NOT yet prepared to identify all the interesting things we can do!

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